Looking for Genes To Protect Beans

Snap bean growers nationwide could benefit if ARS geneticist Phillip N. Miklas succeeds at unlocking the genetic secrets of resistance to white mold disease. Unlike dry beans, snap beans are eaten as flavorful, fleshy green pods. They are sold fresh, frozen, or canned.

Some breeding lines already have partial resistance to white mold, the most costly disease of snap beans in the United States. White mold lowers bean yield and pod quality and can kill the plants. The fungus also infects many other crops, including lettuce, soybean, alfalfa, potato, pea, canola, and sunflower.

Miklas works at the ARS Vegetable and Forage Crop Research Unit in Prosser, Washington. He's teaming up with researchers at Novartis Seeds, Inc., of Nampa, Idaho, under a cooperative research and development agreement. They will each develop a separate population of beans. Both sets of beans will use a breeding line developed at Cornell University as one of the parents. The line demonstrates some resistance to the disease.

For the other parents, they'll use different commercial snap bean varieties that are susceptible to white mold. One population will be used to generate the genetic information and the other to confirm the genetics.

"By crossing a resistant and a susceptible line of beans and then comparing the offspring, we hope to narrow down the location and number of genes responsible for the resistance," Miklas says. Then he plans to develop resistance-linked markers that can be used to incorporate this resistance into commercial snap bean cultivars.

Scientists estimate that 5 to 15 percent of the world's snap bean crop is lost to white mold. The disease costs U.S. farmers $18 million each year in lost yields and fungicide sprays. Worldwide, the crop is worth about $300 million annually. Because the disease lives in the soil and infects a myriad of plants, growers have limited options for using other crop rotations to break the fungus' life cycle.

While the resistance genes would probably apply only to beans, it is possible that information obtained by Miklas may help researchers working with other crops affected by the disease.—By **Kathryn Barry Stelljes,** ARS.

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Listening to Larvae

Entomologist Richard W. Mankin has eavesdropping down to an art. Using a self-developed computer program that can tell the difference between the sounds made by termites, root weevils, and many other insects, he's found a way to expose hidden insects that infest and damage packaged goods, ornamentals, and other valuable agricultural commodities, even golf courses.

"Typically," says Mankin, "the only way to determine whether there is an infestation of insect larvae is to wait for adults to emerge or to dig or cut out a sample. By that time, it can be too late. It's also not economical to dig up large parts of a field or crop to check for infestations."

Mankin, who is with the ARS Center for Medical, Agricultural, and Veterinary Entomology's Post-Harvest and Bioregulation Research Unit in Gainesville, Florida, has developed a nonintrusive eavesdropping tool using a sensor that measures vibrations given off by insects as they move and feed.

The sensor can be attached to a spike that is pushed into soil or poked into a tree trunk, or it can be clamped to a plant stem. By poking the specially rigged nail into a tree or a plank, Mankin can tell whether it's infested with termites just from the sounds he hears. A series of scrapes and clicks in particular rhythms at particular frequencies reveal insects "on the take." Mankin can also use the specially designed clamps to eavesdrop on larvae in stored products or sawflies inside wheat stems.

Different insects give off different sounds, depending on their feeding and movement patterns, their sizes, and what they are eating. Mankin has developed a computer program to distinguish larval movement and feeding activity from background noises, like wind or blowing leaves, and in many cases, the program can distinguish different insects from each other. This is done partly by matching new sounds with previously recorded sounds.

"Our long-term goal is to develop rapid, nondestructive techniques for pinpointing hidden infestations, which should reduce pesticide use and decrease treatment costs," Mankin says. —By **Tara Weaver-Missick,** ARS.

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